SECTION 2

LIMITATIONS

CONTENTS

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SECTION 2

LIMITATIONS

GENERAL

This section includes operating limitations, instrument markings, and basic placards required for safe operation of the helicopter, its engine, and other standard systems. The helicoper is approved as a normal category rotorcraft under FAA Type Certificate No. H10WE as Models R22, R22 Alpha, R22 Beta, and R22 Mariner.

COLOR CODE FOR INSTRUMENT MARKINGS

Red	Operating limit. Edge of red line indicates limit. Pointer should not enter red during normal operation.
Yellow	Precautionary or special operating procedure range.
Green	Normal operating range.

AIRSPEED LIMITS

NEVER-EXCEED AIRSPEED (V_{NE})

Up to 3000 feet density altitude: 102 KIAS

Above 3000 feet density altitude, see placards on page 2-11.

ROTOR SPEED LIMITS

Power On
- Maximum 104% (530 RPM)
- Minimum* 101% (515 RPM)**

Power Off
- Maximum 110% (561 RPM)
- Minimum 90% (459 RPM)

*Transient operation at lower RPM permitted for emergency procedures training.

**97% (495 RPM) permitted on R22s with O-320 engine and tachometer with 97% to 104% green arc installed.

POWERPLANT LIMITATIONS

ENGINE

One Lycoming Model O-320-A2B, -A2C, -B2C, or O-360-J2A.

OPERATING LIMITS

Engine Speed

Maximum continuous	104% (2652 RPM)
Maximum transient***	106% (2700 RPM)
Cylinder Head Max Temperature	500°F (260°C)
Oil Maximum Temperature	245°F (118°C)

Oil Pressure

Minimum during idle	25 psi
Minimum during flight	55 psi
Maximum during flight	95 psi
Maximum during start & warm up	115 psi

Oil Quantitiy, minimum for takeoff 4 qt (3.8 liters)

Manifold Pressure: See placards on pages 2-10 and 2-11 for MAP schedules.

***Intentional operation above maximum continuous speed prohibited.

WEIGHT LIMITS

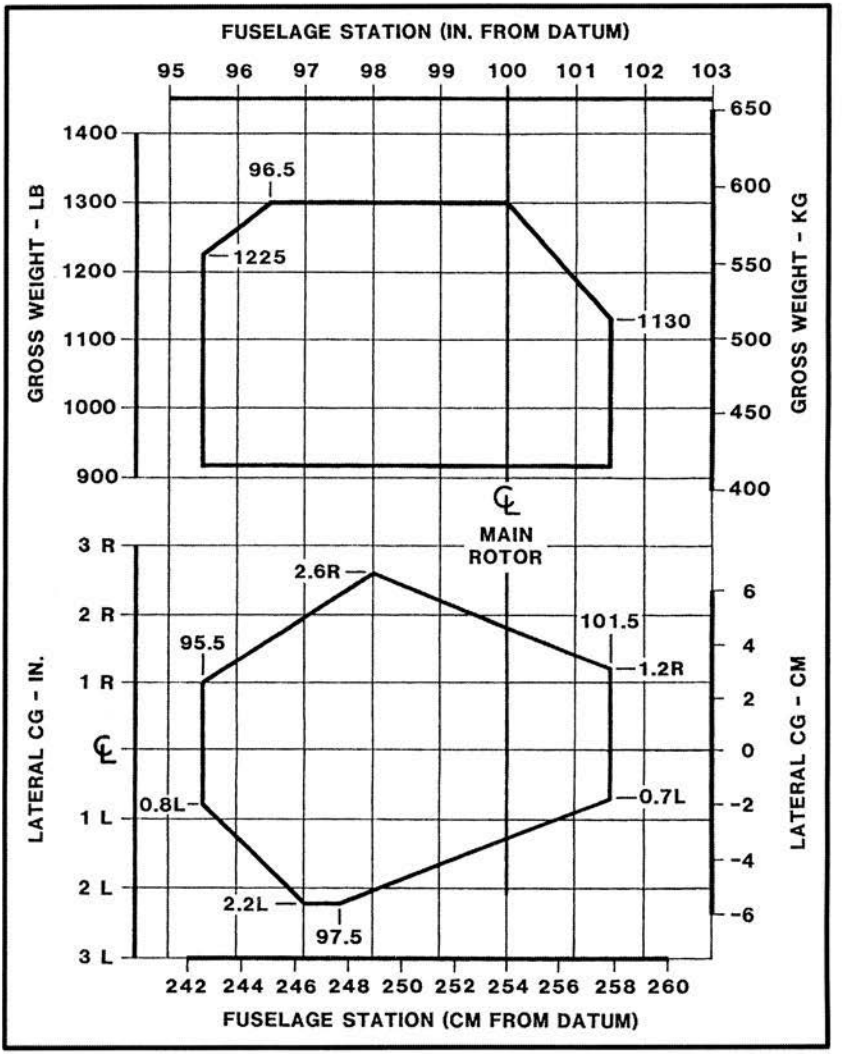
Maximum gross weight – Standard & HP	1300 lb (590 kg)
Maximum gross weight – Alpha, Beta, and Beta II	1370 lb (622 kg)
Minimum gross weight	920 lb (417 kg)
Maximum per seat including baggage compartment	240 lb (109 kg)
Maximum in either baggage compartment	50 lb (23 kg)

CENTER OF GRAVITY LIMITS

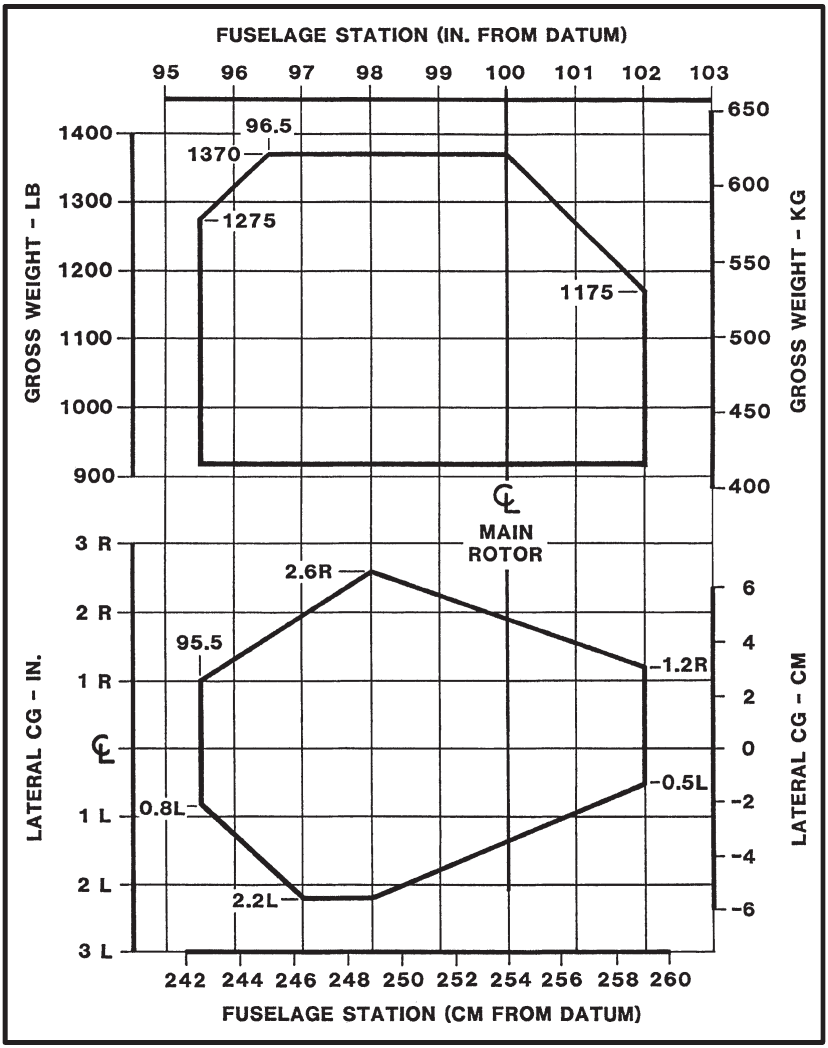
See figures on pages 2-4 and 2-5. Reference datum is 100 inches forward of main rotor shaft centerline.

NOTE

With both doors installed, a solo pilot plus baggage weight of 135 lb (61 kg) or greater will ensure CG within limits. For lower weight, compute weight and balance; removable ballast may be required to obtain CG at or forward of aft limit. (See Loading Instructions in Section 6.)



R22 STANDARD AND HP
CENTER OF GRAVITY LIMITS



R22 ALPHA, BETA, AND BETA II
CENTER OF GRAVITY LIMITS

FLIGHT AND MANEUVER LIMITATIONS

Aerobatic flight prohibited.

CAUTION

Abrupt control inputs may produce high fatigue stresses and cause catastrophic failure of a critical component.

Low-G cyclic pushovers prohibited.

CAUTION

A pushover (forward cyclic maneuver) performed from level flight or following a pull-up causes a low-G (near weightless) condition which can result in catastrophic loss of lateral control. To eliminate a low-G condition, immediately apply gentle aft cyclic. Should a roll commence during a low-G condition, apply gentle aft cyclic to reload rotor before applying lateral cyclic to stop the roll.

Flight prohibited with governor selected off, with exceptions for in-flight system malfunction or emergency procedures training.

Flight in known icing conditions prohibited.

Maximum operating density altitude 14,000 feet.

Alternator, RPM governor, low rotor RPM warning system, and OAT gage must be operational for dispatch.

Minimum crew is one pilot in the right seat. A flight instructor may act as pilot in command from the left seat. Solo flight from right seat only.

Left seat belt must be buckled.

Operation approved with either or both cabin doors removed. Loose items in cabin must be properly secured during doors-off flight.

A functioning headset must be worn by each pilot.

KINDS OF OPERATION LIMITATIONS

VFR day and night operations are approved.

VFR operation at night is permitted only when landing, navigation, instrument, and anti-collision lights are operational. Orientation during night flight must be maintained by visual reference to ground objects illuminated solely by lights on the ground or adequate celestial illumination.

Note: There may be additional requirements in countries outside the United States.

FUEL LIMITATIONS

APPROVED FUEL GRADES

Grade	Color	Specification
100	Green	ASTM D910
100LL	Blue	
100VLL	Blue	
UL 91	Clear to Yellow (no dye)	ASTM D7547
UL 94		
HJELMCO 91/96 UL	Clear to Yellow (no dye)	Hjelmco Oil, Inc. Sollentuna, Sweden
91	Yellow	TU 38.5901481-96 Ukrainian National Standard
B91/115	Green	GOST 1012-72 Russian National Standard
B95/130	Amber	

FUEL LIMITATIONS (cont'd)

FUEL CAPACITY

	Total Capacity US gallons (liters)	Usable Capacity US gallons (liters)
Tanks with bladders:		
Main tank	18.3 (69)	16.9 (64)
Auxiliary tank	9.7 (37)	9.4 (36)
Combined capacity	28.0 (106)	26.3 (100)
Tanks without bladders:		
Main tank	19.8 (75)	19.2 (73)
Auxiliary tank	10.9 (41)	10.5 (40)
Combined capacity	30.7 (116)	29.7 (112)

Note: Per R22 Service Bulletin SB-109A, fuel tanks without bladders should no longer be in service.

INSTRUMENT MARKINGS

AIRSPEED INDICATOR

Green arc	50 to 102 KIAS
Red line	102 KIAS

ROTOR TACHOMETER

Yellow arc	60 to 70%
Lower red line	90 %
Lower Yellow arc	90 to 101%*
Green arc	101 to 104%*
Upper Yellow arc	104 to 110%
Upper red line	110%

ENGINE TACHOMETER

Yellow arc	60 to 70%
Lower red arc	90 to 101%*
Green arc	101 to 104%*
Upper red arc	104 to 110%

*R22s with O-320 engine may have tachometer with green arc from 97% to 104% RPM.

INSTRUMENT MARKINGS (cont'd)

OIL PRESSURE*

Lower red line	25 psi
Lower yellow arc	25 to 55 psi
Green arc	55 to 95 psi
Upper yellow arc	95 to 115 psi
Upper red line	115 psi

*Earlier gages show green arc from 60 to 90 psi and upper red line at 100 psi.

OIL TEMPERATURE

Green arc	75 to 245°F (24 to 118°C)
Red line	245°F (118°C)

CYLINDER HEAD TEMPERATURE

Green arc	200 to 500°F (93 to 260°C)
Red line	500°F (260°C)

MANIFOLD PRESSURE

Yellow arcs denote variable MAP limits.
See placards on pages 2-10 and 2-11.

Standard R22 (O-320-A2B or -A2C Engine)

Yellow arc	23.2 to 25.9 in. Hg
Red line	25.9 in. Hg

HP and Alpha (O-320-B2C Engine)

Yellow arc	21.0 to 24.1 in. Hg
Red line	24.1 in. Hg

Beta (O-320-B2C Engine)

Yellow arc	21.0 to 25.2 in. Hg
Red line	25.2 in. Hg

Beta II (O-360-J2A Engine)

Yellow arc	19.6 to 24.1 in. Hg
Red line	24.1 in. Hg

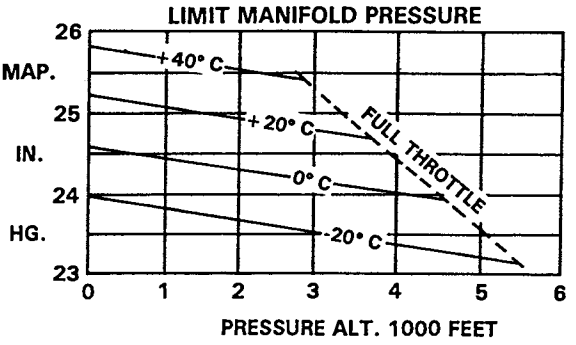
CARBURETOR AIR TEMPERATURE

Yellow arc	-15 to 5°C

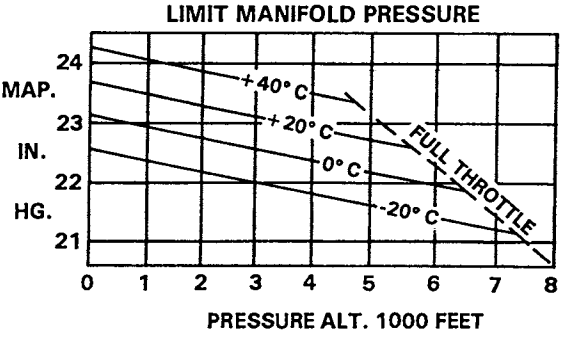
PLACARDS

In clear view and readable by pilot in flight:

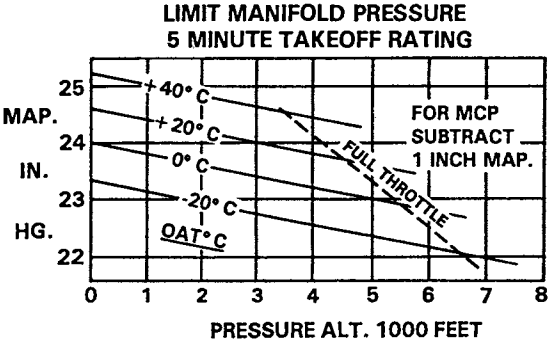
Standard R22
O-320-A2B or
A2C Engine



R22 HP and Alpha
O-320-B2C Engine



R22 Beta
O-320-B2C Engine



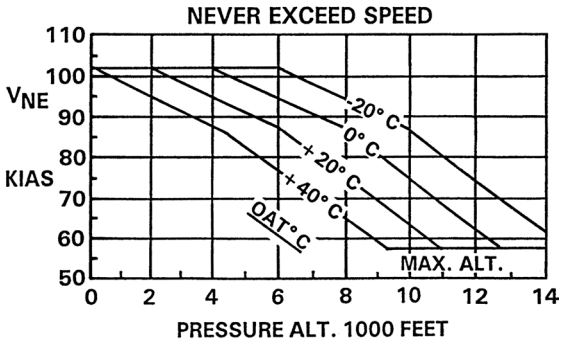
PLACARDS (cont'd)

R22 Beta II
O-360-J2A Engine

LIMIT MANIFOLD PRESSURE - IN. HG

MAXIMUM CONTINUOUS POWER							
PRESS	OAT - °C						
ALT-FT	-20	-10	0	10	20	30	40
SL	21.5	21.8	22.1	22.3	22.6	22.9	23.2
2000	21.1	21.4	21.6	21.9	22.2	22.5	22.8
4000	20.7	21.0	21.2	21.5	21.8	22.0	22.3
6000	20.3	20.6	20.8	21.1	21.3	21.6	21.9
8000	19.9	20.2	20.4	20.7	20.9	FULL THROTTLE	
FOR MAX TAKEOFF POWER (5 MIN), ADD 0.9 IN. HG							

All R22s
except Beta II



R22 Beta II

NEVER EXCEED SPEED - KIAS

PRESS	OAT - °C						
ALT-FT	-20	-10	0	10	20	30	40
SL							
2000						99	96
4000			102			91	87
6000				98	94	82	77
8000		98	94	90	87	75	69
10000	94	90	86	80	75	69	64
12000	86	80	74	68	62	57	
14000	74	67	61	NO FLIGHT			
	61						

PLACARDS (cont'd)

Near main fuel tank filler cap:

FUEL
100 OCT MIN GRADE AVIATION GASOLINE

or

FUEL
91/96 MIN GRADE AVIATION GASOLINE

or

FUEL
AVIATION GASOLINE – GRADE 100LL
OR SEE PILOT'S HANDBOOK

or

R22s with O-320-A2B or -A2C engine may have:

FUEL
80/87 MIN GRADE AVIATION GASOLINE

Near aux fuel tank filler cap:

AUX FUEL
100 OCT MIN GRADE AVIATION GASOLINE

or

AUX FUEL
91/96 MIN GRADE AVIATION GASOLINE

or

AUX FUEL
AVIATION GASOLINE – GRADE 100LL
OR SEE PILOT'S HANDBOOK

PLACARDS (cont'd)

Near shut-off valve:

FUEL ON OFF

Near main tank fuel gage:

For bladder-style tank

16.9 US GAL

For aluminum (non-bladder) tank

19.2 US GAL

Near aux tank fuel gage:

For bladder-style tank

AUX 9.4 US GAL

For aluminum (non-bladder) tank

AUX 10.5 US GAL

In clear view of both occupants:

NO SMOKING

In clear view of pilot (Alpha, Beta, and Beta II with aft battery installations):

MINIMUM SOLO PILOT WEIGHT 130 LB (135 LB WITH FULL AUX FUEL)

or

SEE PILOT'S HANDBOOK FOR SOLO PILOT WEIGHT LESS THAN 135 LB (61KG)

PLACARDS (cont'd)

In clear view of pilot:

THIS ROTORCRAFT APPROVED FOR
DAY AND NIGHT VFR OPERATIONS

LOW-G PUSHOVERS PROHIBITED

On left-hand cyclic:

SOLO FROM RIGHT SEAT ONLY

On or near collective controls:

NO STOWAGE
KEEP AREA CLEAR

Inside each baggage compartment:

CAUTION

DO NOT EXCEED ANY OF THE FOLLOWING:
- COMPARTMENT CAPACITY: 50 LB MAX
- COMBINED SEAT PLUS COMPARTMENT: 240 LB MAX
- ROTORCRAFT GROSS WEIGHT LIMIT

SEE ROTORCRAFT FLIGHT MANUAL FOR ADDITIONAL INSTRUCTIONS

On carburetor air temperature gage:

CAUTION

BELOW 18 IN. MP, IGNORE GAGE
& APPLY FULL CARB HEAT

Near heater push-pull control when heater is installed:

IN CASE OF ENGINE FIRE
PUSH HEATER CONTROL TO OFF

INFORMATION PER FAA AD 95-26-04

The following limitations (1-3) are to be observed unless the pilot manipulating the controls has logged 200 or more flight hours in helicopters, at least 50 of which must be in the RHC Model R22 helicopter, and has completed the awareness training specified in Special Federal Aviation Regulation (SFAR) No. 73, issued February 27, 1995.

1. Flight when surface winds exceed 25 knots, including gusts, is prohibited.
2. Flight when surface wind gust spreads exceed 15 knots is prohibited.
3. Continued flight in moderate, severe, or extreme turbulence is prohibited.

Adjust forward airspeed to between 60 knots indicated airspeed (KIAS) and 0.7 V_{ne} but no lower than 57 KIAS, upon inadvertently encountering moderate, severe, or extreme turbulence.

Note: Moderate turbulence is turbulence that causes: (1) changes in altitude or attitude; (2) variations in indicated airspeed; and (3) aircraft occupants to feel definite strains against seat belts.

RHC NOTE

This AD is issued by the FAA and is applicable to US-registered helicopters.

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